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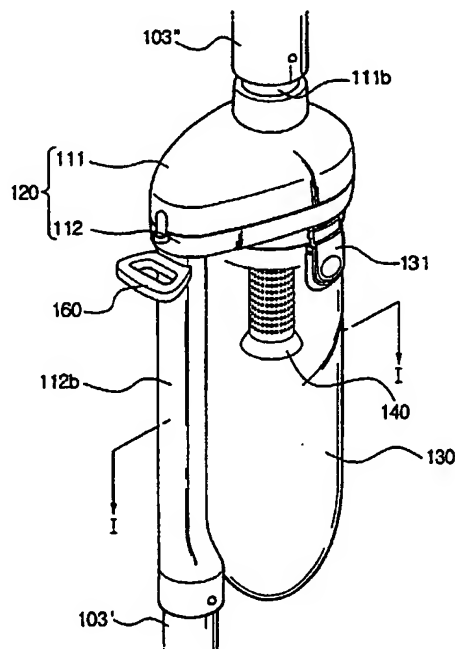
Other: Online: Epodoc, WPI, PAJ

(54) Abstract Title

Pipe arrangement of cyclonic vacuum cleaner

(57) Cyclone dust collecting apparatus for a vacuum cleaner comprises a cyclone body 120, a dust-collecting receptacle 130, and a connection pipe 112b, the dust-collecting receptacle and the connection pipe being disposed alongside each other and their contacting surfaces having a complementary shape. The dust-collecting receptacle is preferably cylindrical, and the portion of the connection pipe in contact with it is contoured to correspond to its shape. The remaining side portions of the connection pipe are substantially flat, to define a generally rectangular cross-section thereof. A handle 160 is provided on the cyclone body, and is preferably integrally formed with said body.

FIG. 4



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FIG. 1

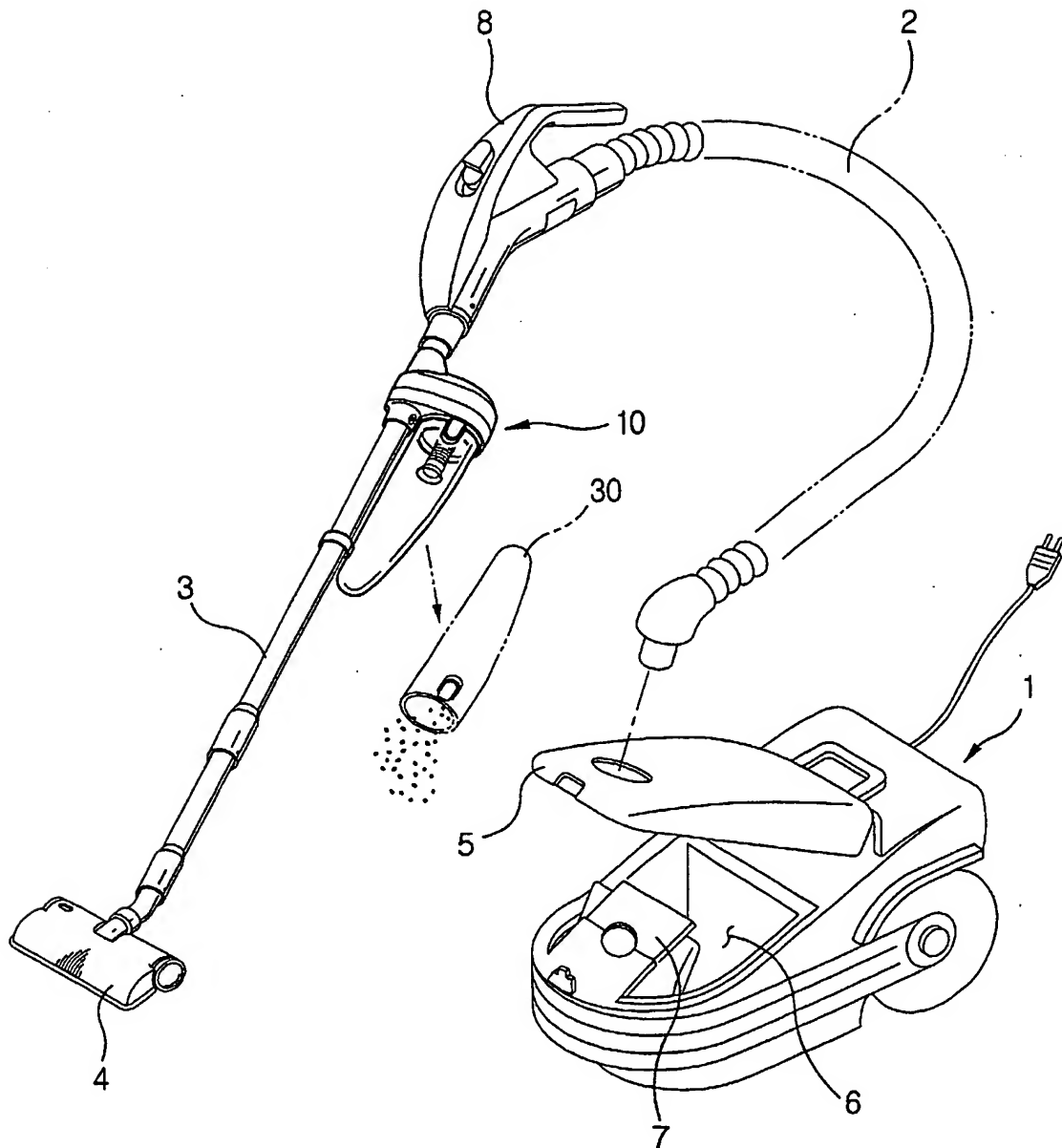


FIG. 2

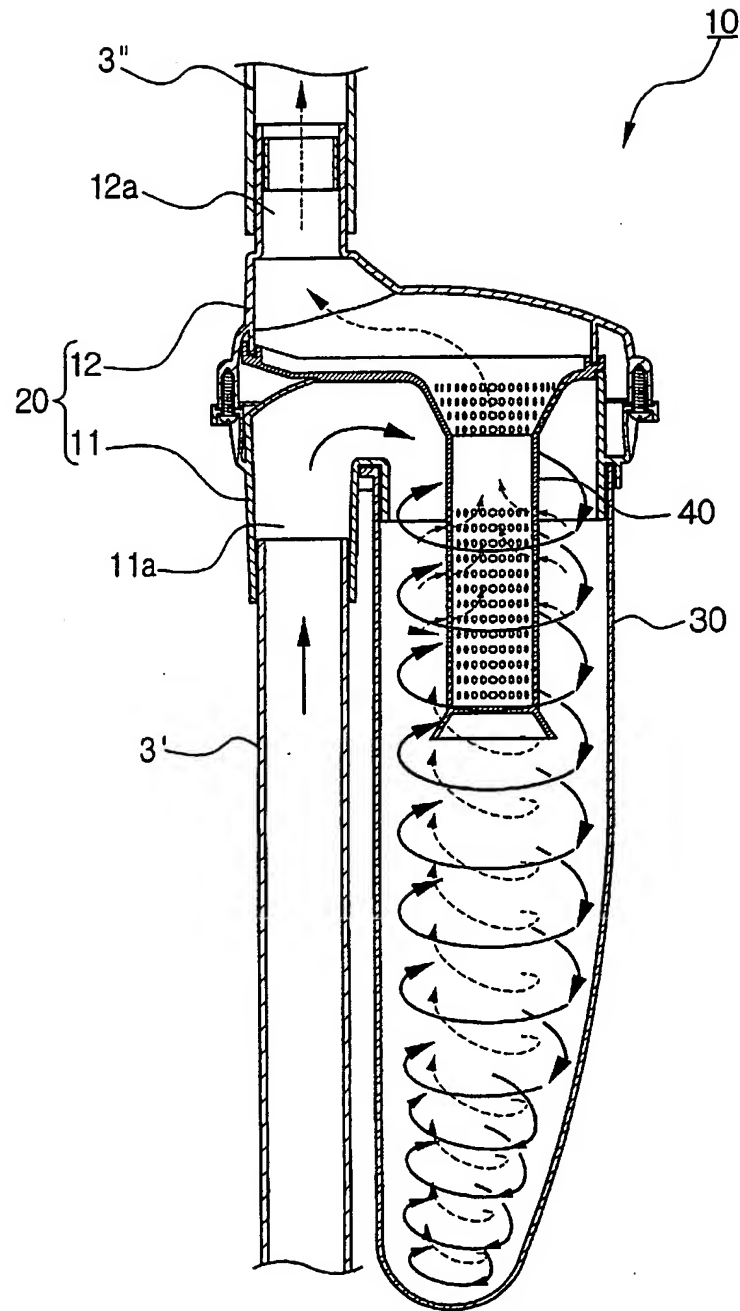


FIG. 3

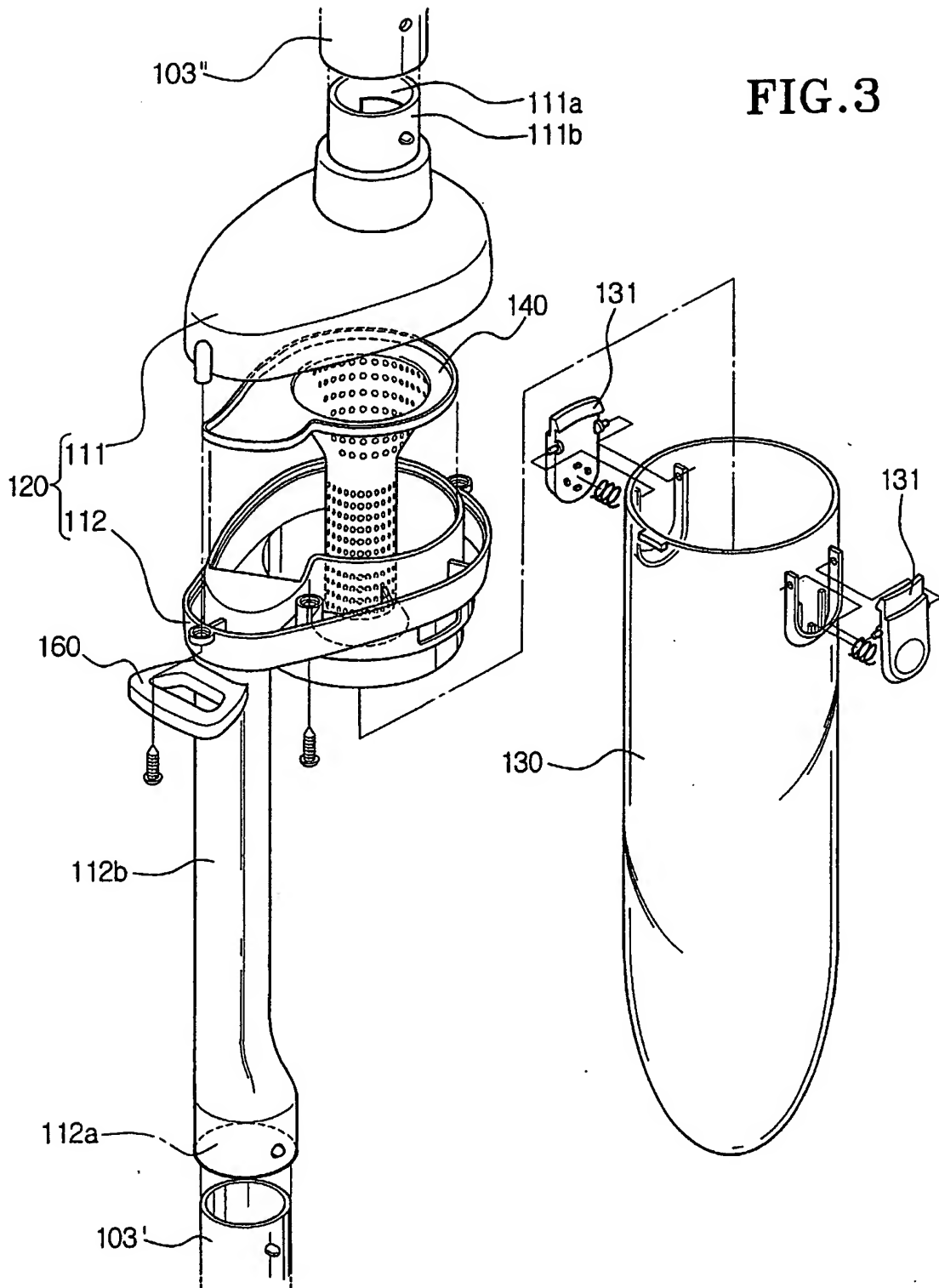


FIG. 4

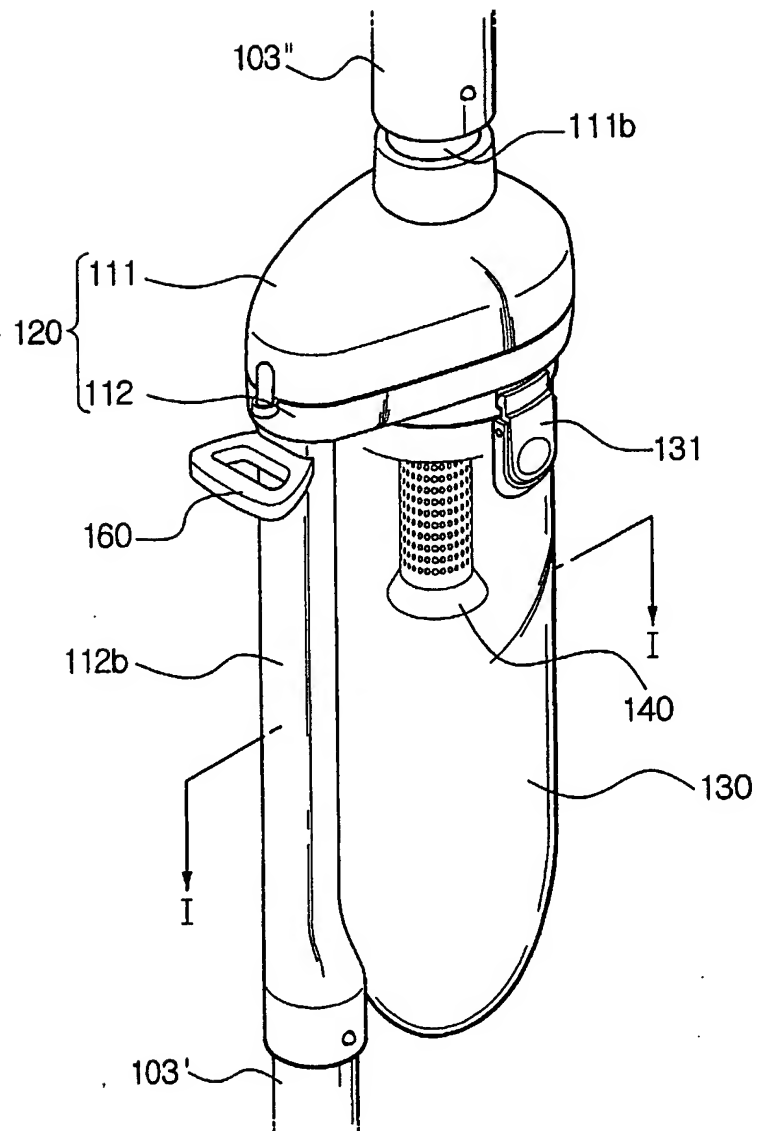
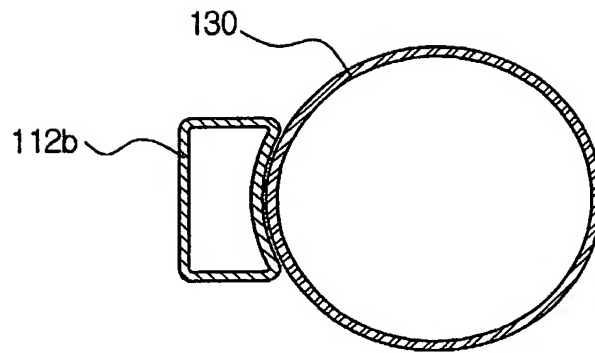


FIG. 5



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Vacuum Cleaner having Cyclone Dust-Collecting Apparatus

The present invention relates to a vacuum cleaner, and in particular to a vacuum cleaner having a cyclone dust-collecting apparatus for filtering out and collecting
5 relatively large particle contaminants from dirt-laden air drawn in through a suction port.

As shown in Figure 1, a known vacuum cleaner has a cleaner body 1, a connection hose 2 connected to the cleaner body, an extension pipe 3 connected to the connection hose, and a suction port 4 connected to an end of the extension pipe. A
10 cover is pivotally mounted on the cleaner body 1, and the cover is connected to the connection hose 2. The cleaner body 1 is provided with an internal dust-collecting chamber 6, a paper filter 7 being removably received in the chamber to collect contaminants such as dust which are vacuumed through the suction port 4. A handle 8
15 is provided between the connection hose 2 and the extension pipe 3. The handle 8 provides a location for a user to manipulate the extension pipe 3, and thereby guide the suction port 4 during cleaning operations.

The vacuum cleaner also includes a motor (not shown) mounted in the cleaner body 1 to generate a suction force to draw in dirt-laden air through the suction port 4. The dirt-laden air is drawn into cleaner body 1 via the extension pipe 3 and the
20 connection hose 2. Solid contaminants are filtered by the paper filter 7 that is disposed in the dust-collecting chamber 6 of the cleaner body 1, while the exiting air is discharged outside of the cleaner body.

With this vacuum cleaner, all of the solid contaminants in the dirt-laden air that is drawn in through the suction port 4 are filtered out at only a single paper filter 7
25 disposed in the dust-collecting chamber 6 of the cleaner body 1. As a result, the paper filter 7 becomes filled with contaminants quickly, and must be replaced often in order to prevent overloading the motor and decreasing the suction force. Accordingly, frequent replacement of this disposable filter 7 increases waste and the cost of operation due to the need to purchase replacement filters.

30 In an attempt to solve this problem, the vacuum cleaner is provided with a cyclone dust-collecting apparatus 10 which serves as a first stage filtration stage, so the filter 7

in the cleaner body 1 can serve as a second stage filtration stage. The collected debris in the cyclone dust-collecting apparatus 10 can be simply dumped without the use of disposable filters.

5 As shown in Figures 1 and 2, the cyclone dust-collecting apparatus 10 is connected to, and forms a part of, the extension pipe 3 that connects the cleaner body 1 and the suction port 4.

10 The cyclone dust-collecting apparatus 10 includes a cyclone body 20 having first and second connection pipes 11 and 12 respectively, a dust-collecting receptacle 30 removably connected to the cyclone body, and a filter member 40 positioned in dust-collecting receptacle. The first connection pipe 11 is connected to an extension pipe 3', and the second connection pipe 12 is connected to an extension pipe 3". The extension pipes 3' and 3" constitute the extension pipe 3 of Figure 1. The dust-collecting receptacle 30 has a substantially cylindrical shape. Alternatively, the dust-collecting receptacle 30 could have the shape of a downwardly-tapering cylinder.

15 In operation, dirt-laden air is drawn in through the suction port 4, and then through an air inlet 11a of the first connection pipe 11 diagonally into the cyclone body 20. As the air current flows diagonally into the cyclone body 20, an air vortex is generated in the dust-collecting receptacle 30, as indicated by the solid-line arrows in Figure 2. As a result of the vortex air current, a centrifugal force is generated, separating large particle contaminants from the air. The separated contaminants fall and then are entrained in an upward air current (indicated by the dot-line arrows of Figure 2) following reflection from the bottom of dust-collecting receptacle 30. In the upward air current, the separated contaminants are discharged towards the cleaner body 1 through an air outlet 12a formed at the end of the second connection pipe 12.

25 Meanwhile, the filter member 40 within the receptacle 30 prevents the contaminants from reversing together with the air flowing through the air outlet 12a during the operation of the cyclone dust-collecting apparatus 10.

30 The vacuum cleaner is constructed such that large particle contaminants of the dirt-laden air drawn in through the suction port 4 are pre-filtered in the cyclone apparatus 10 before the dirt-laden air flows to the paper filter 7. In this manner, the cyclone apparatus 10 functions as a first stage filtration device, and the air exiting the apparatus is directed to the paper filter 7 to undergo an additional filtration step.

Accordingly, the amount of contaminants to be filtered by the paper filter 7 is reduced, and the lifespan of the paper filter is increased. Also, by pre-filtering large particle contaminants, other advantages - such as the prevention of suction force deterioration and motor overload - are expected.

5 A disadvantage of this vacuum cleaner is that the presence of the cylindrical dust-collecting receptacle 30 along the cylindrical extension pipe 3 inevitably increases the overall volume of the cleaner. The cleaner is, therefore, cumbersome, and a user often finds it tiring to use the cleaner and to move it during cleaning operations.

10 An aim of the invention is to provide a reduced-size cyclone dust-collecting apparatus for use in a vacuum cleaner.

Another aim of the invention is to provide a cyclone dust-collecting apparatus which facilitates easy manipulation by a user during cleaning operations.

The present invention provides a cyclone dust-collecting apparatus for use in a vacuum cleaner, the apparatus being arranged, in use, between a suction port and a
15 main body of the vacuum cleaner, the main body containing a motor and a filter, the apparatus comprising:

a connection pipe for connection to the suction port of the vacuum cleaner;

a cyclone body in communication with the connection pipe and connectable to a connection hose that leads to the main body, the cyclone body comprising:

20 a dust-collecting receptacle containing a filtering mechanism, whereby dirt-laden air drawn in through the suction port forms a whirling current in the dust-collecting receptacle and is then discharged to the connection hose; and

wherein the dust-collecting receptacle and the connection pipe are disposed alongside, and in contact with, one another, those side portions of the connection pipe
25 and the dust-collecting receptacle in contact with one another, having a complementary shape.

Advantageously, the dust-collecting receptacle has a substantially cylindrical shape and that portion of the connection pipe in contact therewith is contoured to correspond to the shape of the substantially cylindrical dust-collecting receptacle.
30 Preferably, the remaining side portions of the connection pipe are substantially flat to define a generally rectangular cross-section of the connection pipe.

Accordingly, the overall width of the extension pipe and the dust-collecting receptacle is reduced by this mating geometry, and so the vacuum cleaner is more compact and easier to manipulate, carry and use.

5 The cyclone dust-collecting apparatus also has a handle provided on the cyclone body. The handle is integrally formed with the cyclone body. Accordingly, the user can grip the handle, and perform cleaning operations or carry the cyclone dust-collecting apparatus with ease.

10 The invention also provides a vacuum cleaner including a main body containing a filter and a motor for generating a suction force, a connection hose extending from the main body, a suction port for contacting a surface to be cleaned, an extension pipe connecting the suction port to the connection hose, and a cyclone dust-collecting apparatus disposed between the connection hose and the extension pipe, the cyclone dust-collecting apparatus comprising:

15 a connection pipe in communication with the connection hose and the extension pipe to channel an airstream therethrough;

a cyclone body attached to a downstream end of the connection pipe and containing a filtering mechanism;

20 a dust-collecting receptacle for collecting solid particles trapped by said filtering mechanism and for causing the airstream to travel in a cyclone current therein, the receptacle being attached to the cyclone body and arranged alongside, and in contact with, at least a portion of the connection pipe;

wherein the connection pipe and the receptacle have complementarily-shaped contacting surfaces.

25 The invention will now be described in greater detail, by way of example, with reference to the drawings, in which:

Figure 1 is a perspective view of a vacuum cleaner with a conventional cyclone dust-collecting apparatus;

Figure 2 is an enlarged sectional view of the cyclone dust-collecting apparatus of Figure 1.

30 Figure 3 is an exploded perspective view of a cyclone dust-collecting apparatus contracted in accordance with the invention;

Figure 4 is a view of the cyclone dust-collecting apparatus of Figure 3 as assembled; and

Figure 5 is a cross-section taken on the line I-I of Figure 4.

Referring to the drawings, Figures 3 to 5 show the novel aspects of the cyclone dust-collecting apparatus with reference to the vacuum cleaner described above with reference to Figures 1 and 2. Like parts of the two cleaners will be referred by similar reference numerals, with the parts of the apparatus of Figures 3 to 5 having reference numerals 100 higher than the like parts of the apparatus of Figures 1 and 2. For convenience of description, the location of the elements of the vacuum cleaner will be described with respect to the one-directional airstream or suction force. For example, the extension pipe 103' is upstream of the cyclone body 120, and the extension pipe 103'' is downstream of the cyclone body.

As shown in Figures 3 and 4, the cyclone body 120 of the cyclone dust-collecting apparatus is constituted by a first member 111 and a second member 112, a filter member 140 being disposed in the second member, and a dust-collecting receptacle 130 being fixed at a lower portion of the second member by fastening members 131. The upper portion of the first member 111 is connected to the extension pipe 103'' by a connection pipe 111b. A discharge outlet 111a is formed at the end of the connection pipe 111b. A connection pipe 112b is formed on the second member 112, the connection pipe 112b having a suction inlet 112a provided at the end thereof. The connection pipe 112b is connected to the extension pipe 103' that leads to the suction port (not shown) of the vacuum cleaner.

The air drawn in through the suction inlet 112a forms a vortex air current in the dust-collecting receptacle 130, and then is discharged via the extension pipe 103'' and the discharge outlet 111a. The dust-collecting receptacle 130 is positioned alongside the connection pipe 112b, which has a cross-section that complements the adjacent cross-section of the receptacle 130 along at least a portion of their lengths. Thus, as shown in Figure 5, a surface of the connection pipe 112b adjacent to the dust-collecting receptacle 130 has a shape corresponding to the outer surface of that receptacle, so that these two pieces fit closely together along their co-extensive portions. More specifically, the dust-collecting receptacle 130, in cross-section, is substantially circular, while the adjacent side of the connection pipe 112b is substantially arcuate to

form a concave surface that geometrically mates with the receptacle wall. Since the connection pipe 112b and the dust-collecting receptacle 130 are in close contact with each other due to these respective structural characteristics, they form a more compact overall profile, and thus occupy less space.

5 The overall shape of the connection pipe 112b in a horizontal cross-section along most of the portion that it is co-extensive with the receptacle 130 is approximately rectangular in shape.

10 The lower end of the connection pipe 112b is cylindrical, as shown in Figures 3 and 4, so as to be connectable to the cylindrical extension pipe 103'. Thus, the connection pipe 112b is designed such that the rectangular portion thereof has a smooth transition into the cylindrical portion.

15 A handle 160 is integrally formed on the second member 112 of the cyclone body 120, the handle being designed to have the size and shape that are appropriate for easy gripping by a user. The handle 160 provides the user with a convenient grip when carrying out a vacuum cleaning operation or when carrying the cyclone dust-collecting apparatus.

 A vacuum cleaner incorporating the above-described cyclone dust-collecting apparatus operates in a similar manner as the prior art vacuum cleaner described above with reference to Figures 1 and 2.

20 As described above, the overall thickness of the combination of the extension pipe 112b and the dust-collecting receptacle 130 is reduced, and accordingly, the vacuum cleaner is easier to use. Geometrically mating the outer surfaces of the extension pipe 112b and the receptacle 130 not only renders the apparatus more compact, but also provides an assembly guide surface along their contact areas for easy placement and
25 assembly of the receptacle. In addition, an enhanced attachment is provided, as the two elements 112b and 130 have mating bearing surfaces. This is to be compared to the use of a fastener to join together two circular shapes along a single line as previously used. Further, the structural features of the cyclone dust-collecting apparatus facilitate cleaning operations and transport of the apparatus owing to the provision of the handle
30 160.

Claims

1. A cyclone dust-collecting apparatus for use in a vacuum cleaner, the apparatus being arranged, in use, between a suction port and a main body of the vacuum cleaner,
5 the main body containing a motor and a filter, the apparatus comprising:
a connection pipe for connection to the suction port of the vacuum cleaner;
a cyclone body in communication with the connection pipe and connectable to a connection hose that leads to the main body, the cyclone body comprising:
a dust-collecting receptacle containing a filtering mechanism, whereby
10 dirt-laden air drawn in through the suction port forms a whirling current in the dust-collecting receptacle and is then discharged to the connection hose; and
wherein the dust-collecting receptacle and the connection pipe are disposed alongside, and in contact with, one another, those side portions of the connection pipe
and the dust-collecting receptacle in contact with one another having a complementary
15 shape.
2. Apparatus as claimed in claim 1, wherein the dust-collecting receptacle has a substantially cylindrical shape and that portion of the connection pipe in contact therewith is contoured to correspond to the shape of the substantially cylindrical
20 dust-collecting receptacle.
3. Apparatus as claimed in claim 2, wherein the remaining side portions of the connection pipe are substantially flat to define a generally rectangular cross-section of the connection pipe.
25
4. Apparatus as claimed in any one of claims 1 to 3, further comprising a handle provided on the cyclone body.
5. Apparatus as claimed in claim 4, wherein the handle is integrally formed with
30 the cyclone body.

6. A vacuum cleaner including a main body containing a filter and a motor for generating a suction force, a connection hose extending from the main body, a suction port for contacting a surface to be cleaned, an extension pipe connecting the suction port to the connection hose, and a cyclone dust-collecting apparatus disposed between
5 the connection hose and the extension pipe, the cyclone dust-collecting apparatus comprising:
- a connection pipe in communication with the connection hose and the extension pipe to channel an airstream therethrough;
 - a cyclone body attached to a downstream end of the connection pipe and
10 containing a filtering mechanism;
 - a dust-collecting receptacle for collecting solid particles trapped by said filtering mechanism and for causing the airstream to travel in a cyclone current therein, the receptacle being attached to the cyclone body and arranged alongside, and in contact with, at least a portion of the connection pipe;
 - 15 wherein the connection pipe and the receptacle have complementarily-shaped contacting surfaces.
7. A vacuum cleaner as claimed in claim 6, wherein the dust-collecting receptacle has a substantially cylindrical shape.
20
8. A vacuum cleaner as claimed in claim 7, wherein the connection pipe has a contoured surface configured to complement the substantially cylindrical shape of the receptacle.
9. A vacuum cleaner as claimed in claim 8, wherein the connection pipe has a substantially rectangular cross-section along at least a portion thereof, one side of the rectangular cross-section being concave to complement the substantially cylindrical shape of the receptacle.
25
10. A vacuum cleaner as claimed in claim 9, wherein the connection pipe comprises a portion of substantially circular cross-section to complement a substantially circular cross-section portion of the extension pipe, and a transition
30

portion between the portion of substantially rectangular cross-section and the portion of substantially circular cross-section.

11. A vacuum cleaner as claimed in any one of claims 6 to 10, further comprising a
5 handle provided on the cyclone body to facilitate use and handling of the vacuum cleaner.

12. A vacuum cleaner as claimed in claim 11, wherein the handle is integrally
moulded with the cyclone body.
10

13. A vacuum cleaner comprising a main body containing a filter and a motor for
generating a suction force, a connection hose extending from the main body, a suction
port for contacting a surface to be cleaned, an extension pipe connecting the suction
port to the connection hose, and a cyclone dust-collecting apparatus disposed between
15 the connection hose and the extension pipe, the cyclone dust-collecting apparatus
comprising:

a connection pipe having a substantially rectangular cross-section along at least
a portion thereof, one side of said rectangular cross-section being concave to provide a
contoured surface, the connection pipe being in communication with the connection
20 hose and the extension pipe to channel an airstream therethrough;

a cyclone body attached to a downstream end of the connection pipe and
containing a filtering mechanism;

a dust-collecting receptacle for collecting solid particles trapped by said
filtering mechanism and for causing the airstream to travel in a cyclone current therein,
25 the receptacle having a substantially cylindrical shape attached to the cyclone body and
arranged alongside, and in contact with, at least a portion of the connection pipe; and

a handle provided on the cyclone body to facilitate use and handling of the
vacuum cleaner;

wherein the contoured surface of the connection pipe complements and
30 contacts the substantially cylindrical shape of the receptacle.



INVESTOR IN PEOPLE

Application No: GB 0305016.8
Claims searched: 1-13

Examiner: Dave Woolf
Date of search: 27 June 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 4, 6 and 11	EP 0827710 A2 (ELECTROLUX) Figure 2

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^v:

A4F

Worldwide search of patent documents classified in the following areas of the IPC⁷:

A47L

The following online and other databases have been used in the preparation of this search report :

Online: Epodoc, WPI, PAJ